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A Summary of Current Program 7/1/63; and Preliminary Report of Progress for 7/1/62 to 6/30/63

STANDARDS AND RESEARCH DIVISION

of the

STATISTICAL REPORTING SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

This progress report of U.S.D.A. and cooperative research is primarily a tool for use of scientists and administrators in program coordination, development and evaluation; and for use of advisory committees in program review and development of recommendations for future research programs.

The summaries of progress on U.S.D.A. and cooperative research include some tentative results that have not been tested sufficiently to justify general release. Such findings, when adequately confirmed, will be released promptly through established channels. Because of this, the report is not intended for publication and should not be referred to in literature citations. Copies are distributed only to members of Department staff, advisory committee members and others having a special interest in the development of public agricultural research programs.

This report also includes a list of publications reporting results of U.S.D.A. and cooperative research issued between July 1, 1962 and June 30, 1963. Current agricultural research findings are also published in the U.S.D.A. publications, Agricultural Economics Research and Farm Index. This progress report was compiled in the Standards and Research Division, Statistical Reporting Service, U. S. Department of Agriculture, Washington, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE
Washington, D. C.
July 1, 1963

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INTRODUCTION

There are three Divisions in the Statistical Reporting Service: Agricultural Estimates, Field Operations, and Standards and Research. The Agricultural Estimates Division is located in Washington, D. C. It administers crop and livestock estimating programs designed to provide current information about crop acreages and production, livestock numbers, and other statistics pertaining to the agricultural economy. The Field Operations Division has its headquarters in Washington, D. C., but it administers the field operational activities of the crop and livestock estimating and reporting programs through the medium of 43 field offices which serve the 50 States. The Standards and Research Division, also located in Washington, D. C., administers programs which include the research activities of SRS as well as statistical clearance and the Washington data processing center for the Department. The research is conducted by the Special Surveys and the Research and Development Branches; both Branches perform service as well as research activities.

The Special Surveys Branch conducts studies on consumers' preferences, opinions, and behavior affecting their purchase and use of farm products. These studies are of value in helping to improve the marketing of agricultural products, providing information pertinent to setting grades and standards, and in pointing out areas for technological research to provide product characteristics which more closely satisfy consumer demand. The findings can be applied to increase marketing and merchandizing efficiency all along the distribution line so that returns to producers can be improved and at the same time the satisfaction of consumers increased. The Special Surveys Branch also conducts research on reactions to agricultural programs and services which is designed to provide insights into measures which might be taken to increase their effectiveness.

The Research and Development Branch conducts research on sampling and survey methods as applied to the data collection activities of SRS, and development of techniques of statistical measurement equitable to substantive research.

The work of these Branches is being performed by a staff of about 18 professional employees. Part of the research is conducted by contract with private research organizations and cooperative agreements with land-grant colleges or producer and processor groups. On occasion, funds are transferred to the Division by other government agencies or farm organizations to finance special research studies undertaken at their request.

Some of the more noteworthy recent applications resulting from the research conducted by the Division are outlined below.

Results of studies conducted by the Special Surveys Branch on consumers' opinions of agriculturally-produced materials in various end uses have been used by natural fiber organizations to evaluate the position of cotton and wool in specific segments of the textile industry, and to encourage and guide private industry's efforts to improve the attributes of natural fibers so that they can compete more successfully with synthetics. In addition, each year the National Cotton Council of America bases a major portion of its promotion for consumers and retailers on these research results; these reports have also been used as standard examples in the market development program of Cotton Council International.

In the past few years, a number of studies have been conducted by the Special Surveys Branch in cooperation with the Economic Research Service to evaluate the market potential of new or improved products developed by the USDA's Utilization Research Regional Laboratories. One such survey showed that a superconcentrated

apple juice was well received by consumers and stood a reasonable chance for commercial success if proper processing, merchandizing, and promotional efforts were employed. Because of the favorable reception given the new product in the test city, a company is experimenting with marketing the apple juice in commercial quantities, and has extended the use of the new process to grape juice. Another study undertaken to measure consumer reaction to instant sweetpotato flakes indicates that the product has considerable appeal to homemakers. A number of companies are currently interested in commercial production of this new convenience item.

The improved survey methods developed by the Research and Development Branch are being put into operation by SRS as rapidly as resources will permit. In December of 1962 and June 1963, full-scale enumerative surveys were conducted in 24 States. Objective yield surveys for corn and cotton were also conducted--corn in 23 Southern and Central States and cotton in 10 Southern States. The 1963 winter wheat survey was extended to include 6 northwestern States along with the 9 from the preceding year. The research program which produced the methodology for these surveys is coming into fruition through their incorporation into the operating program of SRS. Work is being continued both in survey methods and in objective yields.

AREA NO. 1: CONSUMER PREFERENCE AND QUALITY DISCRIMINATION-- HOUSEHOLD AND INDUSTRIAL

Problem. With the increasing complexity of marketing channels and methods, it has become almost impossible for the consumer to express to producers either his pleasure or displeasure with available merchandise. In order to market agricultural products more efficiently, we need to understand existing household, institutional, and industrial markets and the reasons behind consumers' decisions to purchase or not to purchase. Information is needed on preferences, levels of information or misinformation, and satisfactions or dislikes of both present and potential consumers. We also need to know consumer attitudes toward the old and new product forms of agricultural commodities and their competitors, and probable trends in the consumption of farm products. We need to know the relationship between agricultural and nonagricultural products and the relationship of one agricultural commodity to another in consumers' patterns of use. Producer and industry groups and marketing agencies consider this information essential in planning programs to maintain and expand markets for agricultural commodities which, in turn, increases returns to growers.

USDA PROGRAM

The Special Surveys Branch of the Standards and Research Division conducts applied research on representative samples of industrial, institutional, or household consumers and potential consumers, in local, regional, or national marketing areas. Such research may be conducted to determine attitudes, preferences, buying practices, and use habits with respect to various agricultural commodities and their specific attributes; the role of competitive products, and acceptance of new or improved products.

The Special Surveys Branch also conducts laboratory and field experiments in sensory discrimination of different qualities of a product. These studies ordinarily relate discrimination to preferences and attitudes as they influence purchases in order to assess the standards of quality, packaging, etc., which are needed to satisfy consumer demands.

In addition to surveys of consumer preferences and discrimination, the Special Surveys Branch also provides consultants and conducts special studies, upon request, for other agencies in the U. S. Department of Agriculture or within the Federal Government, when survey methods can be usefully applied to the evaluation of programs, services, or regulatory procedures of interest to the requesting agencies.

The work of the Branch is carried out in cooperation with other Federal governmental agencies; divisions within the U. S. Department of Agriculture, State Experiment Stations, Departments of Agriculture, and land grant colleges; and agricultural producer, processor, and distributor groups. Closely supervised contracts with private research firms are used for nationwide surveys; studies in selected areas are usually conducted by the Washington staff, with the assistance of locally recruited personnel.

The Branch maintains all of its research scientists, who are trained in social psychology and other social sciences, in Washington, D. C., which is headquarters for all of the survey work whether it is conducted under contract or directly by the Branch.

The Federal scientific effort devoted to research in this area during the past year totaled 7.0 professional man-years under regular program funds. An additional .1 professional man-year was devoted to research conducted under a transfer of funds arrangment.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE PROGRAMS

A. Consumer Preference

1. Fibers in automobiles. The study of materials used in the interiors of 1961 model passenger cars has been completed. This survey provided information about the changes which have occurred in fiber and fabric usage since earlier studies covering 1955 and 1950 models. During the period between 1955 and 1961 cotton maintained its share of the market for materials used in automobile interiors, but the actual volume of cotton used showed a substantial drop due to a decrease in the number of cars produced and the large proportion of compacts. Vinyl increased in share of poundage purchased. Foam and sponge, on the other hand, declined in share of materials used for passenger car interiors, as did burlap, sisal and jute.

In 1961, as in 1955, cotton-backed vinyl was the leading material used for upholstery. Cotton was still clearly the leader for use in seat padding and as foundation sheeting. Although it was still the leading material for headlining in 1961, cotton had lost some of its competitive position to vinyl and paper. The greatest decline in position shown by cotton in 1961 was in its use as a backing in sidewalls, down to 9 percent from 33 percent in 1955. Vinyl's market share increased in all applications except for seat padding, where its use was negligible.

A final report on this survey was published in June 1963.

2. Fibers in young people's clothes. Field work was completed in June 1963 on this nationwide survey of the opinions, attitudes, and preferences of teenage boys and girls about cotton, wool, and man-made fibers in selected items of clothing. The purpose of this study is to provide the cotton and wool industries with information on changing attitudes and preferences so that they can direct their laboratory research and public information efforts more sharply toward strengthening their position with the teenage consuming groups. Pretesting of the interview forms had been completed some time ago but further work was delayed because of the contractor's loss of key staff and other difficulties. Selection of a suitable subcontractor permitted activity on this project to be resumed.

3. Citrus. A representative of the Branch continued to serve as consultant to assist in analysis of data and the preparation of a report on the results of a taste test and a household survey in West Germany. The purpose of these studies is to aid Florida citrus processors in determining the most desirable sugar-acid levels in packs of canned single-strength citrus juice for export and in understanding attitudes of European consumers toward the use of citrus products.

4. Noncitrus fruit. Preliminary planning has been completed and a pretest questionnaire drafted for this nationwide study covering the patterns and frequency of use of selected noncitrus fruits in the home as well as attitudes and opinions which influence use or nonuse of the fruits. Principal emphasis of the questioning is on fresh fruits in general and on apples, the volume leader among noncitrus fruits, in particular, but questions about certain other fresh noncitrus fruits will be included in the questionnaire under terms of the contract signed last year with a private research firm. Some data about processed fruits will also be sought.

5. Winter pears. Exploratory work was carried out on a study designed to assist producers of winter pears in increasing the sales of their products on the fresh market. Since most varieties of winter pears are not particularly suitable for processing, the strengthening of the fresh market for these fruits is especially

important to the growers. A pretest questionnaire was designed to explore household buying and usage patterns for winter pears, with particular emphasis on consumer interest in retail availability of ripe fruit.

6. Apple juice. The final report on a study to determine consumer acceptance, on a commercial trial basis, of a superconcentrated apple juice developed by the Eastern Utilization Research and Development Division of the Agricultural Research Service was published in January 1963. Data from this study, which was conducted in cooperation with Economic Research Service, have been discussed in previous progress reports.

7. Sweetpotatoes. A preliminary statement of results of a consumer panel test, released in April 1963, showed that dehydrated sweetpotato flakes won favor with many housewives. To learn consumer's reactions, researchers supplied a panel of over 200 households in suburban Washington, D. C. with samples of this new product, which was developed by the Southern Utilization Research and Development Division of the Agricultural Research Service. Panel members were requested to prepare the test product in two ways and to indicate their opinion on a rating scale. A majority of the women were at least moderately pleased with the flakes in both the recipes they tried, and praised the convenience of the new product in both dishes. However, the flavor of the more highly seasoned recipes--particularly pie--helped to boost the appeal of the flakes. Further evidence of the women's favorable opinion of the sweetpotato flakes is found in their comparisons of the new product with other forms of sweetpotatoes they had used. For example, a little better than half of those who had used fresh sweetpotatoes in the last year said they would prefer the flakes for making mashed sweetpotatoes. A large majority of the respondents said they would be interested in buying the test product if it were available locally. A more complete analysis and final report of the findings of this study is in preparation.

8. Wheat. The complete report of results of a market test to determine consumer acceptance of a new canned form of cooked whole wheat (bulgur), developed by the Western Utilization Research and Development Division of the Agricultural Research Service, was published in December 1962. This test, details of which were discussed in a previous progress report, was conducted in Wichita, Kansas, in cooperation with Economic Research Service and the Kansas Wheat Commission.

9. Poultry. A contract has been signed with a private research firm to conduct a survey designed to provide a current evaluation of the household market for poultry. Production of both broilers and turkeys has been very high, and prices have been very low. Many business failures have resulted. The overall objective of the proposed research is to obtain information from homemakers which will provide insights into the measures which might be taken by the poultry industry to market poultry more effectively and to increase demand among household consumers. Although the proposed project will be similar in some respects to a 1956 USDA study, the questions to be asked will be revised extensively to reflect the many changes which have occurred in the poultry industry in the past six or seven years and to obtain information on current problems.

10. Milk. Field work was completed in June 1963 on a study to provide information about household consumption patterns of fluid milk and insights into the reasons why consumers prefer and/or use one type of fluid product as compared with other types generally available. Interviews were conducted with householders in two cities where low fat fluid milk is presently sold. Questions were asked about such items as past experience with milk, changes in consumption, attitudes toward various types of milk and use of milk away from home and at guest meals. This study represents

the consumer phase of a research project being undertaken in cooperation with Economic Research Service to study the market characteristics of a low fat fluid milk of approximately 2 percent butterfat content. Interest in the market potential for this "2 percent milk" has been aroused by a shift in consumer dairy purchases between 1950 and 1962 to fluid and dry products which are low fat or nonfat. During this same period, per capita consumption of all types of fluid milk and cream has dropped 11 percent and farm output of milk has risen, causing a serious problem for the entire dairy industry.

11. Duration of household food supplies. A preliminary report on a nationwide survey to ascertain homemakers' estimates of the number of days of food supplies on hand in their households was presented to the Department of Defense; a more detailed analysis of the results for their use is underway. This survey was conducted at the request of the Office of Civil Defense and Defense Mobilization of the Department of Defense and was financed by that office. Field interviewing and tabulation was done by the Bureau of the Census. The Special Surveys Branch developed the questionnaire and is writing the final report.

12. Human resources. The planning, execution, and evaluation of Rural Areas Development (RAD) and Area Redevelopment Administration (ARA) programs would be facilitated if program personnel had systemized knowledge about the attitudes, aspirations, goals, and plans of urban and rural adults and youth regarding education, occupations and employment, and migration. Research providing this knowledge would complement on-going economic analyses, would indicate potentials for more effective development and utilization of human resources, and would aid in attempts to alleviate unemployment and underemployment. At the suggestion of RAD, a proposal is being prepared for an ARA-financed technical assistance project along these lines to be conducted in the Appalachian Region.

B. Quality Discrimination

1. Citrus. Although there is growing evidence that retailers are placing more emphasis on the internal qualities of fresh oranges, there is no information to indicate which specific characteristics are discriminable and preferred by consumers. Planning was begun on taste tests in which one or more panels of people will be asked to taste fresh orange juice samples which have different Brix-Acid levels. The purpose of these tests would be to determine between which brix and acid levels significant discrimination occurs, so that non-discriminable combinations may be eliminated from subsequent consumer preference studies. This research into consumer reactions to various tart-sweet combinations would provide growers and other segments of the trade with guidelines whereby they could select the most desirable tart-sweet levels of fresh oranges for the consumer market.

2. Citrus. Producers of fresh citrus receive lower prices for fruit claimed by wholesale dealers to be objectionable to consumers and therefore to affect adversely their demand for fresh citrus. Planning was begun on a study to determine (a) how household consumers and representatives of various levels of the food distribution trade, including wholesalers and retailers, evaluate quality in fresh citrus fruit, (b) reactions of the trade and consumers to fresh citrus with specified visible defects, and (c) the misconceptions, if any, in the opinions of the trade about what characteristics consumers consider desirable and undesirable in fresh citrus. Further work on this study was delayed because the severe freezes in the principal citrus growing areas during the 1962-63 season prevented the shipment of fruit with characteristics suitable for testing.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

Consumer Preference

Linstrom, H. R. and Graffunder, C. P. 1962. Materials Used in 1961 Automobile Interiors and Convertible Tops--A Preliminary Report. Bulletin SRS-2 (S&R 3-3)

Cotton and Other Materials Purchased by Manufacturers for Interiors of Passenger Cars, 1963. Marketing Research Report No. 616 (S&R 3-3)

Umstott, H. D. and Hollon, D. S. 1962. Redi Wheat -- A New Canned Cooked Bulgur. Marketing Research Report No. 574 (MD 1-46)

McGrath, E. J. and Weidenhamer, M. H. 1963. The Market Potential for Super-concentrated Apple Juice. Marketing Research Report No. 582. (MD 1-45)

Dehydrated Sweetpotatoes Approved by Homemakers (A Preliminary Statement of Results of the Sweetpotato Flakes Consumer Panel Test). Farm Index, April 1963 (S&R 3-5)

AREA NO. 2: IMPROVEMENT OF CROP AND LIVESTOCK ESTIMATING PROCEDURES

Problem. The Statistical Reporting Service produces a large number of current statistics pertaining to agriculture. Because of limited resources, statistical methods were devised with a view to producing the most information for the least cost. These methods are subjective in nature and are based largely upon self-selected samples from voluntary crop reporters who fill out and return mailed questionnaires. The information is generally collected in the form of relatives such as acres this year compared to last, the crop condition as a percentage of full crop. Persistent bias is removed by charting and census or other check data are generally projected to form current estimates. Estimates based on these sample methods have proved relatively satisfactory over the years. However, in seasons when changes are unusually large the changes may not be fully reflected in the appraisals and reports of the respondents to mailed questionnaires. In situations like this, when accuracy is needed most, the estimates may lack the required precision. Then, when the estimates are translated into available supplies for the different commodities, price inequities may occur and, as a result, producers or the processors of agricultural commodities may suffer serious financial loss.

With the development of modern statistics, new methods based upon probability sampling have been developed. Although surveys based upon probability sampling are more expensive to conduct than the traditional self-selecting mailed survey, these new methods offer a means of increasing the precision and reliability of the estimates. A properly designed well-conducted sample survey can produce unbiased estimates which have the desired levels of precision and reliability. Because of the need by the agricultural economy for high quality statistics, it is mandatory that the statistical theory and methods be developed and adapted to the collection of agricultural statistics. Some of the new procedures have already been introduced but there is an urgent need for a continuing research to devise efficient survey methods so as to make possible continuing improvement in the quality of SRS statistics.

USDA PROGRAM

The Department of Agriculture conducts a program of applied research designed to strengthen and improve the methodology used in collecting agricultural statistics. The principal disciplines involved are mathematics, statistics and probability, but other disciplines relating to a particular problem are brought to bear as required. Examples of these are plant physiology, psychology, cartography and photogrammetry. The current program consists of 6.0 professional man-years per year devoted to the study of sample and survey methods, and 4.0 professional man-years working on methods for forecasting and estimating the yields of important crops. Work under this program is done in Washington, D. C., and in SRS field offices located in the States concerned.

Research objectives in survey methods are concerned with the improvement of all aspects of survey design. These include questionnaire and form design, universe definition and sampling frame construction, sample design and estimators, enumeration techniques, quality checks, editing procedures, methods of processing data and the post-analysis of the survey with a view to improvement of design. In the current program priority is being given to the construction of an area sampling frame for 11 Eastern States; to the investigation of sources of lists, their maintenance and optimum use as sampling frames for probability sampling; and to the problem of developing methodology for collecting data by mail and enumeration in the same sample survey using lists in conjunction with area as frames. A preliminary exploration of the possibility of using aerial photography in estimating

acreages of crops and numbers of livestock is being made. In this area, problems requiring study are those of sample design and photo interpretation as well as the use of this technique to supplement a general-purpose survey. Response errors are being studied. Here the objective is to establish communication with the respondent through the medium of a questionnaire which will transmit concepts with a high degree of fidelity and at the same time induce the respondent to reply and reply honestly and fully. An attempt is being made to distinguish between those items for which the respondent has accurate knowledge, those items which he may have once known but no longer recalls accurately, those items which he had never known precisely, and those items for which he is unwilling to divulge information or gives deliberately misleading information. Where applicable, alternative sources of information will be sought and different ways of motivating respondent cooperation will be tested.

Work on objective yields is being continued. This includes the refinement of the forecasting models being tested as well as the development of forecasting procedures for other important crops. Corn, cotton, wheat, and soybean models are being refined by computing parameters based upon larger samples and by broadening the range of plant maturity recognized by the model. Among the other crops for which objective forecasting procedures are being developed are grapes, onions, sorghum, and pasture grasses. The studies on forecasting sorghum yields and the production of pasture grasses are being conducted under a cooperative agreement with Iowa State University in Ames, Iowa.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE PROGRAMS

A. Objective Measurement of Yields

1. Wheat. The 1963 winter wheat objective studies were continued in the 9 States covered during earlier years and expanded to 6 new States. The new States added were South Dakota, Colorado, Idaho, Montana, Oregon, and Washington. Objective yield counts were made in about 1,000 winter wheat fields for the 9 original States and about 275 pre-harvest field counts were made for the new States. Weekly counts and observations were also made in about 60 winter wheat fields for the new States during the entire growing season to obtain information for developing forecasting models to be used in 1964. Further improvements have been made in the early season forecasting model for predicting the number of heads expected at harvest time. Additional refinements are being made to utilize another estimator to forecast the number of heads based on the stages of maturity. For the June 1 survey, the usual total stalk count was made as well as an additional count of all stalks over 10 inches in height. Preliminary analysis indicates that the latter count will provide a more efficient estimator for heads expected, particularly for mature samples in those fields where dead tillers may account for a large portion of the total stalk count. A second estimator for this component has been developed that appears promising for use on June 1 for most States. This involves a current to harvest adjustment for the June head count.

Some improvement in predicting final grain weight per head was obtained by using grain counts rather than a spikelet count for fields with fully developed heads. Additional refinements are needed to provide the desired accuracy for predicting head weight of samples in the "late boot" or "flower" stage of maturity. Laboratory procedures were modified somewhat to provide more detailed counts for a small sample of heads to obtain additional data for formulating a second estimator to be used on June 1. Forecast estimates of yield for May and June from a computer program were prepared for each individual State's use in preparing its estimates and for the Crop Reporting Board's use for the 9 States that have been in the

research program for several years. Final pre-harvest estimates were made for all States for use in connection with the August 1 Crop Report. Procedures for updating monthly estimates of acreages for harvest using the survey data were continued.

Objective yield counts and observations were started during 1963 in 6 spring wheat States (North Dakota, South Dakota, Montana, Idaho, Washington, and Minnesota.) A single pre-harvest visit was made to about 400 fields in these States for making one estimate of yield at harvest time. Weekly counts and observations were made in about 65 spring wheat fields during the entire growing season to obtain information for developing forecasting models to be used in 1964.

2. Sour cherries. In 1962 objective sampling of sour cherries was extended to include 20 sample orchards in each of New York, Pennsylvania, and Wisconsin, in addition to the 180 orchards in Michigan. This extension was made possible by a grant in funds from the Cherry Producers Marketing Cooperative, Inc., of Grand Rapids, Michigan, in the interest of developing objective methods which would forecast over 98 percent of the sour cherry production in the Great Lakes Region. In each State, studies were made in two phases, the first a series of four sample surveys conducted over the season on a probability sample of orchards to estimate fruit numbers per tree and weight per cherry as of average survey date. Coefficients of variation for averages of fruit per tree were about 8 percent in Michigan and about twice as large in the other three States where samples were much smaller. Coefficients of variation for average weight per fruit were approximately 2 percent in Michigan and 5 percent in the other States.

The second phase of the sampling investigations was a development study based upon frequent visits of 5 or 6 orchards in each State. Observations were made on bloom development and pit hardening, and to determine the rates of fruit droppage and weight development. Date of hardening is closely related to date of bloom and is a desirable indicator of relative maturity which occurs later in the growing season than bloom. However, pit hardness is much more difficult to measure objectively and will require continued research to develop measurement techniques and to establish a series of data. Parameter curves have been developed for predicting mature fruit numbers and weight per cherry by combining data from the yield and development phases of the cherry project. For the June 15 forecast, these parameters are used to project for the remaining 18 to 45 days until harvest. The June 15 survey averages represent 107-209 percent of actual numbers of fruit at harvest and as little as 7 percent of the harvest weight per fruit.

These parameters were developed for the three districts in Michigan to permit a differentiation between early and late districts. Pennsylvania parameters are similar to the earliest Michigan district; likewise Wisconsin is more nearly like the latest district in Michigan but these similarities would need to be verified over years.

Plans to continue in 1963 with investigative sample surveys in New York, Pennsylvania, and Wisconsin were abandoned because industry funds were not again supplied for this work.

The Michigan sampling program was revised to incorporate one additional survey visit in early June. This survey, in one-fourth of the sample orchards, provided an estimate of the fruit droppage rate for the period just preceding the June 15 forecasting survey. This estimate of relative drop rate was applied to the droppage parameter curves to derive an estimate of days past bloom on a biological rather than a time basis.

In the development study, observations of pit hardening were made more objective by using scales to measure cutting pressure.

In both 1962 and 1963, Michigan data for June 15 and July 1 were used to calculate experimental forecasts which proved to be effective estimators.

3. Soybeans. The objective yield studies on soybeans were conducted in 9 North Central States and Arkansas and Mississippi in 1962. Mississippi was added in 1962 while South Dakota and Wisconsin were dropped. In these 11 States, 421 samples were allocated roughly proportional to State acreage. Minor modifications of field counts were made in 1962 which result in less detailed counts on each plant in the row sections but detailed counts were made on more plants beyond the unit. The additional plants reduced the between plant component in the variance of the mean number of pods per plant, but this component is still a large factor in the variation present in the number of pods per plant. For the August 1 forecast, a model was developed to forecast the ratio of estimated pods with beans present to pods with beans at harvest using the ratio of pods to total fruit and nodes per plant. Parameters for each State have been derived since this estimator appears quite stable with varying conditions from year to year. In Arkansas and Mississippi, the maturity of the crop is later so that estimates using pod counts are not suitable. A model using blooms instead is being developed. For the September 1 forecast, the relationship between the number of pods with beans present and pods with beans at harvest is being adjusted by planting date to allow for variation in stage of maturity. This model appears to satisfactorily estimate pods with beans at harvest if stable regressions can be established. Another estimator, which is basically the same as for August, is being tried in a few States.

Research is continuing on the problem of forecasting bean weight on September 1 using pods with beans from two plants beyond the unit. However, with the present size sample, a forecast seems usable only for the entire region.

In 1963 detailed counts within the unit similar to those prior to 1962 were made in an attempt to overcome the bias in selection of the plants beyond the unit. In order to study the fruiting pattern of soybean plants more closely, weekly counts were made during the 1963 growing season in Mississippi and Kansas. This additional detail and more frequent observations should give a stronger basis for developing models which are stable over time.

4. Corn. Yield studies were conducted during the 1962 crop season in about 340 fields in Michigan, South Dakota, and Virginia. Sample fields were allocated, by States, as follows: Michigan, 100 samples; South Dakota, 120 samples; and Virginia, 120 samples. Forecasting procedures were developed for these States similar to those prepared in other States. In 1963, the corn sample in Michigan, South Dakota, and Virginia was increased to an operational level while the sample in the other operational States remained unchanged from 1962.

Forecasts of the number of ears to be formed have been improved by sharpening up the definition of the stage of maturity for each ear of corn. These definitions are based on external characteristics of the plant and ears as well as kernel characteristics. In the past there have been some serious inconsistencies in the way field enumerators have defined maturity classifications of ears. With present modifications in definition, we hope to overcome this problem. Computer programs have been written which permit more comprehensive analysis of the corn data and forecasting parameters have been developed for each State. The more detailed analysis by States should provide improvement over previous parameters which were based on small samples and based largely on regional analysis.

Studies to indicate the potential damage from frost which are based on maturity considerations are being continued. A computer program for the 11 North Central States was written in 1962 for these data and the analysis has been completed. This study indicates the extent of acreage affected and the degree of damage in terms of grain weight loss. Greater use is expected from this information as more experience is gained in different crop years.

Based on previous experience, it was found that the State laboratories were doing an adequate job of determining sample ear weight; therefore, the central laboratory was discontinued in 1963.

Greater use is being made of information concerning fields remaining for harvest. This adjustment is being made throughout the crop seasons, i.e., acres intended for harvest for grain is estimated for August 1, September 1, October 1, and final pre-harvest.

Although considerable improvement is expected from the State parameters prepared for use in 1963, additional improvement is expected as a result of analysis currently underway to determine State parameters by maturity classifications.

5. Irrigated cotton. Fruit counts and plant characteristic information were gathered for about 110 irrigated cotton fields in California, New Mexico, and Arizona. This information provided additional assistance in establishing a second early season estimator for large bolls expected at harvest time based on survival of young fruit. This estimator is based on a relationship between the index of maturity and rate of survival for each type of young fruit counted. The actual survival was determined by color tagging young fruit and then counting mature fruit for the various colored tags. A modified procedure for counting young fruit was tested on a small subsample of plants. The accuracy of the counts was greatly improved and virtually all the bias that had been observed for several years was eliminated.

Since the present estimator for the other component in the forecasting model, average boll weight, does not provide a reliable indication of boll weight until about October 1 when one-fourth of the bolls set have opened, another estimator was sought. Preliminary analysis shows that there is a very good relation between the number of seed present in a large unopened boll and the final weight of seed cotton for it at harvest time. Further study is planned to explore the possibility of using this estimator in the forecasting model.

Seed cotton picked from the sample units for the 1962 crop was ginned for the first time to determine if the assumed ginning ratio of .370 currently used in the forecasting model needed adjustment. The ginning results showed the total weight of cotton picked to be broken down in the following proportion: (1) seed - .619, (2) lint - .376, and (3) foreign material - .005. Further study in this area has been proposed to see if these proportions hold constant over years of crop seasons.

6. Onions and Grapes. Growth and development studies of small scope have been conducted for grapes and onions by the Michigan State field office. This work is partially financed by research fund allocations from the Research and Development Branch and the remainder by interested people in Michigan, who provided assistance and suitable experimental plots.

Onions: In 1962 an onion development study was begun in Michigan. Samples of onions were selected weekly from five plots. Onion weights and sizes were observed for parts of the onion plant ranging from the entire plant to a length of 2 inches at the bulb end. In 1963 a similar series of observations is being

conducted, with the series beginning early enough in each plot to detect the first visible bulb formation. The 1963 work is being done at the experimental muck farm of Michigan State University, which has voluntarily prepared plots of important varieties with early, late, and intermediate planting dates.

Grapes: Development studies have been conducted in Michigan in three vineyards each year beginning in 1960. Visits have been made twice monthly from July 1 until harvest to make counts of clusters per vine and weight and number of berries per cluster. Also in 1962 a pre-harvest survey of 25 sample vineyards was used to provide data of greater precision on variability and useful relationships.

Early counts of clusters can be used to forecast numbers at harvest time. Ratio of clusters maturing to clusters formed is very high with low variability between years. These relationships are nearly the same for numbers of berries per cluster, a property of special significance because of the very high within-year correlations between berries per cluster and cluster weight. The limited data of this development work demonstrates that this relationship is quite good between years, but not constant. Continued analysis and added data will establish the worth of early berry counts in forecasting bunch weight. Also, the use of an estimated biological reference date, such as date that berries attain some minimum weight, will be evaluated as to effectiveness in utilizing berry counts.

The 1963 series is being conducted on the same basis as previously, but with vines sampled in a different cluster configuration to determine relative efficiencies of alternative vine selection systems.

7. Pasture Grasses. The study of measuring the production was continued in 1962 under a cooperative agreement with Iowa State University. Sampling was conducted in six university-owned pastures, three of brome alfalfa and three of Kentucky bluegrass. As in 1961, half the plot sets were mowed weekly and half biweekly.

For purposes of analysis, all the data were adjusted to a common area (10' x 33") corresponding to the size of the mowed plots (1A, 1B, etc.). The yield for a mowed plot was obtained by adding the yield of the hand-clipped subplot (expanded to 10' x 33") to the yield realized by mowing. One estimate of growth was obtained by subtracting the average yield of plots 1A, 1B, 2A, and 2B obtained at the beginning of the time period from the yield of the caged plot (plot 3) obtained at the end of the time period. Another estimate was obtained by subtracting the average yield of plots 6 and 7 (the small hand-clipped plots just outside the cage) from the caged plot. The point estimates for the entire season were negative in both instances. The estimate using the large plots tested significantly different from zero at the 5 percent level; the estimate using the small plots did not. The standard error of the estimated growth based on the beginning measurements from the large plots (1A, 1B, 2A, 2B) was estimated to be about 154 pounds per acre per week. The standard error using the small plots close to the cage as the beginning measurements was slightly smaller. The between pasture component of variance was estimated to be very small relative to the within pasture component. The eye estimates exhibited a nonsignificant (at the 5% level) correlation with the weights of the harvested forage.

The results indicate the presence of bias in the procedure used. Edge bias would appear to be the most likely. Since the forage from the mowed plots was collected by raking, bias in the form of extraneous material (sticks, dirt, etc.) may have been introduced here that would not be present in the hand-clipped plots. Other possible sources of bias, such as bias in the placement of the cages, exist; however, the foregoing appear to be the more important possibilities.

As a result of the 1962 experience several changes have been incorporated in the 1963 procedures. The eye estimates have been abandoned. The plots cut at the beginning of each time period are located just outside the cage, are entirely hand-clipped, and are the same size as the plot under the cage cut at the end of the period; thus, any edge bias present should affect the beginning and ending measurements equally. Finally, after the initial placing of the cages, subsequent settings have been determined by a clearcut procedure involving accurate measuring with a type which should preclude any bias in this operation.

8. Sorghum. The sorghum objective yield project was continued at Iowa State University in 1962. The sample consisted of sorghum fields on 55 farms in southwest Iowa. Each farm was visited three times--early August, September, and October. On the initial visit the farmer was interviewed and sample plots were established. On later visits counts were made on these same plots. On each visit two heads were clipped and sent to Ames for laboratory analysis. The regression estimates for heads to be harvested (based on plants counted in August and heads counted in September) have satisfactory correlation and appear rather stable over years. Of the factors investigated for estimating weight per harvested head, an expanded weight per kernel (based on 100 kernels) gives the most stable estimate. However, this factor requires that the heads be harvested. Of the field counts investigated, the measurement at the base of the head appears the most promising.

Components of variance were calculated to evaluate the efficiency of plots of different sizes in estimating mean weight per head from the sorghum heads that were sent to the laboratory in early October. There were approximately 10 heads from each plot, two from each of the 3 six-foot sub-rows in row one, and the heads from two tagged plants in each of 2 nine-foot sub-rows in the adjacent row. When there are no essential cost differences per head, a six foot plot leads to a smaller variance of the mean that the nine or eighteen-foot plots.

B. Survey Methods

1. Response Errors:

A. A project concerned with response errors in interview surveys was carried out at North Carolina State College. The work covered two distinct phases:

1. An analysis of discrepencies using re-enumeration data from the the June 1962 Enumerative Survey in North Carolina.

2. An experiment conducted in connection with the December 1962 Enumerative Survey in North Carolina.

From the re-enumeration data two analyses were made:

1. An index was developed to reflect the performance of the data collection process.

2. An analysis was designed to partition response errors from sampling errors and to estimate the components. Location and experience were tested using the discrepency index but no significant difference was apparent after a log transformation was made to normalize the marginal distribution. If the average of the original and re-enumeration are used for total variance, response variation becomes a large portion of this total.

The December 1962 experiment used three factors: respondent selection, place of interview, and official vs. friendly approach. The eight treatment combinations were formed using a 2^3 factorial structure. The effect of these factors is traced as to:

(1) Enumerators' acts
(2) Course of the conversation
(3) Quality of recorded data

Conduct of the interview in the field, when possible, was found to be associated with several desirable results. Selection of a respondent has practically no effect. An official approach was strongly associated with more stable responses.

B. From December 1962 to June 1963 about 75 respondents who had previously been mailed livestock surveys in central Iowa were interviewed. Respondents were chosen who had some apparent problem in reporting on their livestock operation. These operators were asked to complete a questionnaire containing many of the same questions as were on the mailed questionnaire. Probing was used as needed to establish the validity of the answers and to some extent the degree of estimation in them. These questionnaires were summarized with the comparable questionnaire returned by mail. Because of the small number of interviews and consideration of problem cases only, the validity of conclusions which may be drawn are quite limited. However some tendencies are apparent.

Some operators have considerable trouble in classifying hogs into weight classifications and into market or breeding stock and must rely heavily on estimation. Probing is necessary in many cases to be sure that all animals on the farm have been included in the total. Pigs saved per litter tends to decrease with increased probing.

This decrease apparently comes from two sources:

(1) Sows which farrow but lose all their pigs may not be reported.
(2) Initially pigs born may be reported and not pigs saved.

The reporter has difficulty in answering questions on death losses. Some of the difficulty is in memory but farmers appear hesitant to consider the questions with careful thought. Large losses of pigs is likely to be considered a reflection of poor managment practices which evidently causes part of their reluctance.

2. <u>Survey Procedures in the Western States:</u>

The assembly of the land use area sampling frame was completed for the 11 Western States (Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.) Refinements of the sampling frame are needed to facilitiate more rapid and convenient procedures for drawing area samples using these new materials and for controlling the number of farms per segment. A pilot area survey program was initiated in June of 1963. The new land use strata were used as a basis for allocating sample units. A primary objective of the pilot surveys was to verify experimentally the sampling errors for a wide variety of crop and livestock items. Another objective was to provide a basis for making objective sampling estimates available for both wheat acreage and yields so all the major wheat producing areas could be included.

The sample consisted of 1,370 area segments which were allocated to the strata in the 11 States as follows: I Cultivated, 953 segments; II Cities and towns, 42 segments; III Nonagricultural, 14 segments; and IV Rangeland, 361 segments.

3. List Frames:

During the June Enumerative Survey in 1961, interviewers in Iowa screened 1,050 segments for farm operators in addition to the 350 segments used in the regular survey. These 1,400 segments contained about 2,100 resident farm operators. These names were matched as accurately as possible with names in the 1961 State Farm Census taken in January, February, and March of 1962. The Census covers acreage operated and crops for 1961, and livestock inventories at the time of the interview. Several classifications were used in the matching to facilitate analysis, such as:

(1) Geographic location (crop reporting districts)
(2) Type of June interview (the 350 regular survey segments required a much longer interview)
(3) Type of segment (open country or non-open country)

Preliminary calculations indicate that about 90 percent of the farm operators listed in the June survey can be matched with names in the State Farm Census, with a larger proportion being matched in open country segments than in non-open country segments. About 87 percent of all names with any entry for crops or livestock were matched. Operators of small farms tend to report larger farm acreages in the June survey than in the State Farm Census but the difference declines and may even reverse as farm size increases. This difference in reported acreage is apparently larger for the segments screened only to identify farm operators than for farm operators interviewed in the regular segments where more detailed information is obtained on the exact nature of the operations.

4. Probability Mailing List:

Work on this project was initiated in 1961, with the screening of segments of land associated with those enumerated during the June Enumerative Survey for farm operators residing inside the segments. This was done in two States--Iowa and Alabama. The lists developed by this process were probability samples of the farm operators residing in these two States. These lists contained the names and addresses of 1,667 farm operators in Alabama, and 1,656 such operators in Iowa. Three mailed surveys were conducted in each State using these lists. The first survey used the September 1 general crop report schedule, the second used the acreage and production card, and the third survey used the December livestock schedule. A sample of 300 non-respondents to each of the three mailed surveys was drawn in each State and the information obtained by interview.

The following table shows the number of usable questionnaires returned by mail and the number of non-respondents actually interviewed.

Item	MAILED RETURNS		NON-RESPONDENT INTERVIEWS	
	Iowa	Alabama	Iowa	Alabama
September Farm Report	308	499	278	248
A. & P. Survey	443	516	281	245
December Livestock Survey	387	436	245	261

Specifications have been prepared for a computer program which will analyze the data collected for this project. In addition to summarization, which will include computation of estimated means, totals, variances, and non-response bias; intra-cluster correlations will be computed for (1) the cluster composed of the farm headquarters physically located within the 4-segment cluster, and (2) the cluster composed of 4 segments, i.e., each segment is considered to be a secondary sampling unit.

An attempt will be made to establish a response pattern based on an "Interest" Index for each of the farm operators included on the mailing lists used for each of the three mailed surveys. Once this index has been developed, further analysis is planned to examine the relationship, if any exists, between the index and estimates based on mailed returns. It is expected that relationships discovered by this procedure can be used to remove the non-response bias for estimates either by (1) substantially reducing the number of non-respondent interviews required, or (2) using the relationship with mailed returns and eliminating the need for interviews when a probability list is used in conducting sample surveys. Other ideas and relationships will be tested as the analysis progresses with the ultimate view toward developing practical estimating techniques and procedures which can be employed to improve the current crop and livestock estimating program.

Line Project Check List -- Reporting Year July 1, 1962 to June 30, 1963

Work & Line Project Number	Work and Line Project Titles	Work Locations During Past Year	Line Proj. Incl. in Summary of Progress	Line Proj. Incl. in Area & Sub-subheading
S&R 3	(Supersedes MD-1) Household and Industrial Consumer Attitudes and Sensory Discrimination Studies.			
MD 1-13 (rev.)	Stability of criteria used by homemakers to evaluate fibers in selected items of clothing. **	Washington, D. C.	No	
MD 1-38	Outerwear apparel fabric manufacturers' attitudes, and opinions toward the blending of wool with synthetic fibers. **	Washington, D. C.	No	
MD 1-41	High school children's food habits and attitudes, and their opinions related to the national school lunch program. **	Washington, D. C.	No	
MD 1-45	An appraisal of the market possibilities for super-concentrated apple juice through a consumer survey. **	Washington, D. C.	Yes	1-A-6
MD 1-46	An evaluation of the market possibilities of a canned wheat bulgur through a consumer survey. **	Washington, D. C.	Yes	1-A-8
S&R 3-1	Young people's use and appraisals of natural and competing fibers used in wearing apparel.	Washington, D. C.	Yes	1-A-2
S&R 3-2	Study of attitudes toward pilot food stamp operations.	Washington, D. C.	No	
S&R 3-3	Fabric and fiber patterns of use and preferences among automobile manufacturers.	Washington, D. C.	Yes	1-A-1
S&R 3-4	Study of the effect of selected characteristics of fresh citrus fruit on trade and consumer acceptance.	Washington, D. C.	Yes	1-B-2
S&R 3-5	Consumer acceptance of sweetpotato flakes.	Washington, D. C.	Yes	1-A-7
S&R 3-6	Consumer preferences, usages, and buying practices for noncitrus fruits.	Washington, D. C.	Yes	1-A-4
S&R 3-7	Study to determine consumer preferences and consumption pattern for various types of fluid milk. *	Washington, D. C.	Yes	1-A-10
S&R 3-8	Consumer preferences, usages, and buying practices for poultry. *	Washington, D. C.	Yes	1-A-9
S&R 3-9	Consumer interest in retail availability of ripe winter pears. *	Washington, D. C.	Yes	1-A-5
S&R-0-0-1(DOD)	Homemakers' estimates of food on hand.	Washington, D. C.	Yes	1-A-11
S&R 4	Improvement of Crop and Livestock Estimating Methods			
S&R 4-1	Studies on the relationship of early-season plant observations made on sorghum and pasture grasses to final yield.	Ames, Iowa	Yes	2-A-7 2-A-8
S&R 4-2	Development of improved sample survey procedures for crop and livestock estimates in certain North Central and Southern States. **	Wash., D. C. & State offices of Va., Mich., Minn., Mo., Nebr., Ohio, S. Dak., & Wis.	No	
S&R 4-3	Development of improved sample survey procedures for crop and livestock estimates in Western States. *	Wash., D. C. & State offices of Ariz., Calif., Colo., Idaho, Mont., Nev., N. Mex., Oreg., Utah, Wash., & Wyo.	Yes	2-B-2
S&R 4-4	Development of improved forecasts and estimates of corn yields and development of procedures for forecasting corn quality in 7 North Central States and Virginia. **	Wash., D. C. & State offices of Mich., Minn., Mo., Nebr., Ohio, S. Dak., Wis., & Va.	Yes	2-A-4

* Initiated during reporting year.
** Discontinued during reporting year.

Line Project Check List -- Reporting Year July 1, 1962 to June 30, 1963

Work & Line Project Number	Work and Line Project Titles	Work Locations During Past Year	Line Proj. Incl. in Summary of Progress	Line Proj. Incl. in Area & Sub-subheading
S&R 4-5	Development of improved forecasts and estimates of winter wheat yields.	Wash., D. C. & State offices of Tex., Okla., Ill., Ind., Kans., Mich. Mo., Nebr., Ohio, Colo., & Mont.	Yes	2-A-1
S&R 4-6	Development of improved forecasts and estimates of soybean yields in selected States.	Wash., D. C. & State offices of Ark., Ill., Ind., Iowa., Kans., Mich., Minn., Miss., Mo., Nebr., & Ohio	Yes	2-A-3
S&R 4-7	Development of an improved sampling and data collection procedure for estimating prices received and prices paid by farmers. **	Wash., D. C. and State office in Ohio	No	
S&R 4-8	Improvement of yield forecasts on sour cherries and apples through objective fruit counts and measurements.	Wash., D. C. and State offices in Mich., N. Y., Pa., & Wis.	Yes	2-A-2 2-A-6
S&R 4-9	Development of improved forecasts for yield of irrigated cotton.	Wash., D. C. & State offices of N. Mex., Calif., & Ariz.	Yes	2-A-5
S&R 4-10	Probability mailing list from screened segments.	Wash., D. C. & State offices of Iowa & Ala.	Yes	2-B-4
S&R 4-11	Study of the farm operator as a supplier of agricultural statistics. *	Raleigh, N. C.	Yes	2-B-1(A)
S&R 4-12	Study of lists of farm operators as sampling frames for collecting agricultural statistics. *	Wash., D. C. & all continental States	Yes	2-B-3
S&R 4-13	Study of response and other non-sampling errors. *	Wash., D. C. & Ames, Iowa	Yes	2-B-1(B)
S&R 4-14	Study of aerial photography as a supplementary survey technique in making crop and livestock estimates. *	Wash., D. C. & all continental States	No	

* Initiated during reporting year.

** Discontinued during reporting year.